



Overweight and Obesity, a Worsening Health Problem Particularly in Children

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The prevalence of overweight (OW) and obesity (OB) is increasing in both adult and child populations throughout the world.¹ Childhood OB has been rising at an alarming rate in the United States (U.S.)^{2,3} and may be even more prevalent in Hawaii⁴⁻⁶ causing a wide range of serious complications.

OW and OB is defined as a condition of pathological excess of body fat, and generally is measured by body mass index (BMI=weight in kg over height in meter squared).⁷ Cut off points for adult OW and OB are set at ≥ 25 kg/m² and ≥ 30 kg/m², respectively.⁸ Although the measurement of childhood and adolescent OW and OB is a highly debated issue,⁹ the most widely applied¹⁰ and feasible method uses an age adjusted BMI developed from averaging international percentile data.¹¹ More accurate methods for excess fat measurement exist but are more costly, hazardous and/or time consuming.¹²

Never before in the history of human evolution was childhood obesity a general health problem, but during the last several decades not only obesity in adults but excess weight in children and adolescents has reached epidemic proportions.³ Data from 1999-2000 revealed that the prevalence of OW in the United States was 15.5% among the 12 to 19 year-olds, 15.3% among 6 to 11 year-olds, and 10.4% among the 2 through 5 year-olds, compared with 10.5%, 11.3%, and 7.2%, respectively, in 1988-1994 (National Health and Nutrition Examination Survey III, NHANES III).³ Few such data exist for children in Hawaii. One study examined the prevalence of OW between 1992 and 1996 among 1437 students ages 6 to 17 years in one school district in Hawaii.⁴ This longitudinal study included more residents of Hawaiian ancestry (62-71%) and reported that relative to the nationwide OW prevalence rates (NHANES III) the investigated population had a 2.1-2.5 fold and 1.5-2.5 fold higher OW rate in Hawaiian and in non-Hawaiian children, respectively.⁴ Similar trends were reported a decade ago.^{13,14}

OB is now recognized as one of the most common health problem facing children.¹⁵ OW and OB not only in adulthood but already in childhood are known to have significant impacts on both physical and psychosocial health¹⁶⁻¹⁸ including insulin resistance, type 2 diabetes mellitus (T2DM), dyslipidemia (high total cholesterol, LDL cholesterol, and triglycerides and low HDL cholesterol), increase in CRP (marker for inflammation),¹⁹⁻²² premature atherosclerosis, hypertension and increased left ventricular mass, all of which are major risk factors for cardiovascular causes for death.^{7,8,23,24} T2DM, a known risk factor for cardiovascular disease and typically considered a disease of adults, parallels the epidemic of OB in children.⁷ There is data suggesting the disease process moves faster in children than in adults.²⁵

Other health problems associated with childhood OB include obstructive sleep apnea, increasingly severe asthma, pseudotumor

cerebri, blount disease, slipped capital femoral epiphysis, flatfeet, decreased bone mineral content for age, cholelithiasis, hepatic steatohepatitis and many psychologic and social complications.^{7,26-32} As health problems associated with OB in childhood, adolescence,²⁴ and adulthood may not be fully reversible by weight loss, prevention has to gain more interest.³³

Childhood OB tends to persist into adulthood in 30% to 80% of the cases, and an adult who was an obese child has a likelihood of more serious comorbidities than if the OB developed in adulthood.^{34,35} In the U.S. OB is estimated to account for 14 percent and 20 percent of all deaths from cancer in men and women, respectively and represents a high risk factor especially for pancreatic and liver cancer in males, and kidney, uterus, and postmenopausal breast cancer in females.³⁶ High energy intake, large body mass index, and physical inactivity increase risk of colorectal cancer independently.³⁷ Earlier menarche, a risk factor for breast cancer due to longer lifetime estrogen exposure, is reached with higher body weight, while exercising decreases female breast cancer risk.³⁸⁻⁴¹ This is important to note because native Hawaiian girls were reported to have more body fat and a significantly lower age at menarche than non-Hawaiian classmates.⁴²

Risk of OB related complications differs by ethnic origin and may be a result of cultural factors. For example, Asian Americans and Pacific Islanders who constitute the majority (over 50%) of the populations in Hawaii⁴³ are at high risk for T2DM.⁴⁴ Among Japanese school-children, the incidence of T2DM increased from 0.2 to 7.3 per 100,000 children per year between 1976 and 1995.⁴⁵ For Pacific Islanders there is a dearth of information in this respect especially in children.⁴⁶ A few studies in adult Pacific Islanders have shown that indigenous people such as the Samoans, Hawaiians, and the Marshallese have developed substantially higher rates of OB than the U.S. population over the last 40 to 50 years.^{5,6} In migrants to Hawaii the situation might be worse because the prevalence of OW in female Western Samoan adults was 46% in Western Samoa but 80% once moved to Hawaii.⁴⁷ These studies also noted a more central distribution of fat based on the waist/hip ratio,⁴⁸ which is associated with "atherogenic" serum lipid profiles.⁴⁹⁻⁵¹ In Pacific Islanders the risk for comorbidities despite the same degree of adiposity was several times higher than among the U.S. Population.^{6,52-54} Statewide surveys showed that native Hawaiians have higher than average mortality rates from T2DM, coronary heart disease and various cancers⁴³ and that life expectancy of both Hawaiians and part Hawaiians is the lowest among all major ethnic groups in Hawaii.^{55,56}

The cause of OB represents a complex interaction of genetics, diet, metabolism, and physical activity but is mostly due to increased energy intake and/or decreased energy expenditure.⁴⁶ Energy-dense

foods high in fat and sugar (foremost fast-food, snack food and sodas) lead to increased malnutrition and overnutrition.⁵⁷⁻⁶⁰ The problem is aggravated by a decrease in physical activity (physical education programs, leisure-time physical activity, biking, walking, outdoor playing, etc.)^{15,61} and more inactive time at the TV, computer, game boy, telephone, and others.⁶²⁻⁶⁴

Although prevention is clearly the best way to try to solve this health problem, treatment can be successful once OB has occurred, particularly in children, who can lose and maintain weight loss easier than adults.⁶⁵ Culturally competent treatment strategies need to be developed to increase physical activity and to encourage healthy eating patterns among children and their families. For example, the Waianae Diet program has been a successful clinical program for the Native Hawaiian population.⁶⁶⁻⁶⁸ Family-based programs appear to be the most efficacious in reducing OB prevalence and in long-term maintenance of a healthy diet and lifestyle⁶⁹⁻⁷¹ as compared to school-based programs.⁷² Best results are achieved if physicians, behavioral psychologists, dietitians and exercise specialists are involved in a concerted effort with frequent interactions.⁷³⁻⁷⁶

However, without comprehensive actions by many sectors of our society (removing fast foods and sodas from schools, curbing food advertisement and marketing directed at children, increasing physical education programs, building bike paths, pedestrian zones and playgrounds, subsidizing nutritious foods, improving insurance coverage for effective obesity treatment, etc.) Hawaii will suffer the effects of an increasing obese population with substantial obesity related morbidity and mortality.

Today's obesity-associated annual hospital costs in the U.S. increased more than three fold to \$127 million since 1980¹⁶ despite a significantly decreased life expectancy caused by obesity.^{77,78} Direct medical costs in 1995 accounted for an estimated \$70 billion and ranked as the second leading cause of preventable premature death in the U.S.^{79,80} In view of this trend childhood obesity in Hawaii must be studied further and aggressively pursued as an important health problem. Our societies will not be able to bear the socioeconomic burden inadvertently connected with the qualitatively and quantitatively worsening comorbidity cases of future obese generations.

For more information on the Cancer Research Center of Hawaii please visit our website at www.crch.org.

References

- WHO: Obesity: prevention and managing the global epidemic, Geneva, WHO publication NUT/98.1; 1998.
- Flegal KM, Carroll MD, Ogden CL, Johnson CL: Prevalence and trends in obesity among US adults, 1999-2000. *JAMA* 2002;288:1723-1727.
- Ogden CL, Flegal KM, Carroll MD, Johnson CL: Prevalence and trends in overweight among US children and adolescents, 1999-2000. *JAMA* 2002;288:1728-1732.
- Chai D, Kaluhiokalani N, Little J, et al: Childhood overweight problem in a selected school district in Hawaii. *Am J Human Biol* 2003;15:164-177.
- Bindon JR: Polynesian responses to modernization: overweight and obesity in the south Pacific, in de Garine I, Pollock NJ (eds): *Social Aspects of Obesity*. New York, Gordon and Breach; 1995:227-252.
- Hodge AM, Dowse GK, Toelue P, Collins VR, Ima T, Zimmet PZ: Dramatic increase in the prevalence of obesity in western Samoa over the 13 year period 1978-1991. *Int J Obes Relat Metab Disord* 1994;18:419-428.
- Styne DM: Childhood and adolescent obesity. Prevalence and significance. *Pediatr Clin North Am* 2001;48:823-854, vii.
- Mokdad AH, Ford ES, Bowman BA, et al: Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *JAMA* 2003;289:76-79.
- Sorensen TI, Holst C, Stunkard AJ: Childhood body mass index—genetic and familial environmental influences assessed in a longitudinal adoption study. *Int J Obes Relat Metab Disord* 1992;16:705-714.
- Reilly JJ: Assessment of childhood obesity: national reference data or international approach? *Obes Res* 2002;10:838-840.
- Cole TJ, Bellizzi MC, Flegal KM, Dietz WH: Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 2000;320:1240-1243.
- Goran MI: Measurement issues related to studies of childhood obesity: assessment of body composition, body fat distribution, physical activity, and food intake. *Pediatrics* 1998;101:505-518.
- Brown DE, Johnson JL, Severance CJ: Growth of native Hawaiian schoolchildren: I research, stature and weight measurements. *American Journal of Human Biology* 1991;3:677-688.
- Brown DE, Severance CJ, Sako EK, Chun DY, Young LL, Johnson JL: Growth of native Hawaiian schoolchildren: II body mass index and skinfold measurement. *American Journal of Human Biology* 1992;4:433-445.
- Shell ER: *The Hungry Gene*. New York, Atlantic Monthly Press; 2002.
- Wang G, Dietz WH: Economic burden of obesity in youths aged 6 to 17 years: 1979-1999. *Pediatrics* 2002;109:E81-81.
- Schwimmer JB, Burwinkle TM, Varni JW: Health-related quality of life of severely obese children and adolescents. *JAMA* 2003;289:1813-1819.
- Kang HS, Gutin B, Barbeau P, Litaker MS, Allison J, Le NA: Low-density lipoprotein particle size, central obesity, cardiovascular fitness, and insulin resistance syndrome markers in obese youths. *Int J Obes Relat Metab Disord* 2002;26:1030-1035.
- Ridker PM, Rifai N, Rose L, Buring JE, Cook NR: Comparison of C-reactive protein and low-density lipoprotein cholesterol levels in the prediction of first cardiovascular events. *N Engl J Med* 2002;347:1557-1565.
- Das UN: Is obesity an inflammatory condition? *Nutrition* 2001;17:953-966.
- Rifai N, Buring JE, Lee IM, Manson JE, Ridker PM: Is C-reactive protein specific for vascular disease in women? *Ann Intern Med* 2002;136:529-533.
- Visser M, Bouter LM, McQuillan GM, Wener MH, Harris TB: Low-grade systemic inflammation in overweight children. *Pediatrics* 2001;107:E13.
- Freedman DS, Srinivasan SR, Valdez RA, Williamson DF, Berenson GS: Secular increases in relative weight and adiposity among children over two decades: the Bogalusa Heart Study. *Pediatrics* 1997;99:420-426.
- Anonymous: Relationship of atherosclerosis in young men to serum lipoprotein cholesterol concentrations and smoking. A preliminary report from the Pathobiological Determinants of Atherosclerosis in Youth (PDAY) Research Group. *JAMA* 1990;264:3018-3024.
- Must A, Jacques PF, Dallal GE, Bajema CJ, Dietz WH: Long-term morbidity and mortality of overweight adolescents. A follow-up of the Harvard Growth Study of 1922 to 1935. *N Engl J Med* 1992;327:1350-1355.
- Sinha R, Fisch G, Teague B, et al: Prevalence of impaired glucose tolerance among children and adolescents with marked obesity. *N Engl J Med* 2002;346:802-810.
- Davison KK, Birch LL: Weight status, parent reaction, and self-concept in five-year-old girls. *Pediatrics* 2001;107:46-53.
- Belamarich PF, Luder E, Kattan M, et al: Do obese inner-city children with asthma have more symptoms than nonobese children with asthma? *Pediatrics* 2000;106:1436-1441.
- Loder RT, Aronson DD, Greenfield ML: The epidemiology of bilateral slipped capital femoral epiphysis. A study of children in Michigan. *J Bone Joint Surg Am* 1993;75:1141-1147.
- Honore LH: Cholesterol cholelithiasis in adolescent females: its connection with obesity, parity, and oral contraceptive use—a retrospective study of 31 cases. *Arch Surg* 1980;115:62-64.
- Guzzaloni G, Grugni G, Minocci A, Moro D, Morabito F: Liver steatosis in juvenile obesity: correlations with lipid profile, hepatic biochemical parameters and glycemic and insulinemic responses to an oral glucose tolerance test. *Int J Obes Relat Metab Disord* 2000;24:772-776.
- Dietz WH Jr, Gross WL, Kirkpatrick JA Jr: Blount disease (tibia vara): another skeletal disorder associated with childhood obesity. *J Pediatr* 1982;101:735-737.
- Pi-Sunyer FX: Medical hazards of obesity. *Ann Intern Med* 1993;119:655-660.
- Parsons TJ, Power C, Logan S, Summerbell CD: Childhood predictors of adult obesity: a systematic review. *Int J Obes Relat Metab Disord* 1999;23 Suppl 8:S1-107.
- Guo SS, Chumlea WC: Tracking of body mass index in children in relation to overweight in adulthood. *Am J Clin Nutr* 1999;70:145S-148S.
- Calle EE, Rodriguez C, Walker-Thurmond K, Thun MJ: Overweight, obesity, and mortality from cancer in a prospectively studied cohort of U.S. adults. *N Engl J Med* 2003;348:1625-1638.
- Le Marchand L, Wilkens LR, Kolonel LN, Hankin JH, Lyu LC: Associations of sedentary lifestyle, obesity, smoking, alcohol use, and diabetes with the risk of colorectal cancer. *Cancer Res* 1997;57:4787-4794.
- Anderson SE, Dallal GE, Must A: Relative weight and race influence average age at menarche: results from two nationally representative surveys of US girls studied 25 years apart. *Pediatrics* 2003;111:844-850.
- Du X, Greenfield H, Fraser DR, et al: Low body weight and its association with bone health and pubertal maturation in Chinese girls. *Eur J Clin Nutr* 2003;57:693-700.
- Enger SM, Ross RK, Paganini-Hill A, Carpenter CL, Bernstein L: Body size, physical activity, and breast cancer hormone receptor status: results from two case-control studies. *Cancer Epidemiol Biomarkers Prev* 2000;9:681-687.
- Bernstein L, Ross RK: Re: Physical activity and breast cancer risk in a cohort of young women. *J Natl Cancer Inst* 1998;90:1907-1909.
- Brown DE, Koenig TV, Demorales AM, McGuire K, Mersai CT: Menarche age, fatness, and fat distribution in Hawaiian adolescents. *Am J Phys Anthropol* 1996;99:239-247.
- American Cancer Society: *Hawaii Cancer Facts and Figures 2003-2004*. Honolulu, American Cancer Society, Hawaii Pacific, Inc.; 2003.
- The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus: Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care* 2002;25 Suppl 1: S5-20.
- Kitagawa T, Owada M, Urakami T, Yamauchi K: Increased incidence of non-insulin dependent diabetes mellitus among Japanese schoolchildren correlates with an increased intake of animal protein and fat. *Clin Pediatr (Phila)* 1998;37:111-115.
- Crawford PB, Story M, Wang MC, Ritchie LD, Sabry ZI: Ethnic issues in the epidemiology of childhood obesity. *Pediatr Clin North Am* 2001;48:855-878.
- McGarvey ST: Obesity in Samoans and a perspective on its etiology in Polynesians. *Am J Clin Nutr* 1991;53:1586S-1594S.
- Grandinetti A, Chang HK, Chen R, Fujimoto WY, Rodriguez BL, Curb JD: Prevalence of overweight and central adiposity is associated with percentage of indigenous ancestry among native Hawaiians. *Int J Obes Relat Metab Disord* 1999;23:733-737.
- Mamalakis G, Kafatos A, Manios Y, Kalogeropoulos N, Andrikopoulos N: Abdominal vs buttock adipose fat: relationships with children's serum lipid levels. *Eur J Clin Nutr* 2002;56:1081-1086.

50. Baumgartner RN, Roche AF, Chumlea WC, Siervogel RM, Glueck CJ: Fatness and fat patterns: associations with plasma lipids and blood pressures in adults, 18 to 57 years of age. *Am J Epidemiol* 1987;126:614-628.
51. Galanis DJ, Sobal J, McGarvey ST, Pelletier DL, Bausserman L: Ten-year changes in the obesity, abdominal adiposity, and serum lipoprotein cholesterol measures of Western Samoan men. *J Clin Epidemiol* 1995;48:1485-1493.
52. Grandinetti A, Chang HK, Mau MK, et al: Prevalence of glucose intolerance among Native Hawaiians in two rural communities. Native Hawaiian Health Research (NHHR) Project. *Diabetes Care* 1998;21:549-554.
53. Curb JD, Aluli NE, Kautz JA, et al: Cardiovascular risk factor levels in ethnic Hawaiians. *Am J Public Health* 1991;81:164-167.
54. Grandinetti A, Keawe'aimoku Kaholokula J, Chang HK, et al: Relationship between plasma glucose concentrations and Native Hawaiian Ancestry: The Native Hawaiian Health Research Project. *Int J Obes Relat Metab Disord* 2002;26:778-782.
55. Aluli NE: Prevalence of obesity in a Native Hawaiian population. *Am J Clin Nutr* 1991;53:1556S-1560S.
56. Gardner RW: Life tables by ethnic group for Hawaii, 1980. *R S Rep* 1984;1-15.
57. Ellis PR, Roberts FG, Low AG, Morgan LM: The effect of high-molecular-weight guar gum on net apparent glucose absorption and net apparent insulin and gastric inhibitory polypeptide production in the growing pig: relationship to rheological changes in jejunal digesta. *Br J Nutr* 1995;74:539-556.
58. Nielsen SJ, Siega-Riz AM, Popkin BM: Trends in Energy Intake in U.S. between 1977 and 1996: Similar Shifts Seen across Age Groups. *Obes Res* 2002;10:370-378.
59. Harnack L, Stang J, Story M: Soft drink consumption among US children and adolescents: nutritional consequences. *J Am Diet Assoc* 1999;99:436-441.
60. Morton JF, Guthrie JF: Changes in Children's Total Fat Intakes and Their Food Group Sources of Fat, 1989-91 Versus 1994-95: Implications for Diet Quality. *Family Economics and Nutrition Review* 1998;11:44-57.
61. Troiano RP: Physical inactivity among young people. *N Engl J Med* 2002;347:706-707.
62. Gorinstein S, Caspi A, Goshev I, et al: Beer consumption and changes in stability of human serum proteins. *J Agric Food Chem* 2001;49:1441-1445.
63. Anonymous 1998 Report on Television, New York, NY, Nielsen Media Research; 1998.
64. Roberts DF, Foehr UG, Rideout VG, Brodie M: Kids and the Media at the New Millennium: A Comprehensive National Analysis of Children's Media Use, Menlo Park, CA, The Henry J. Kaiser Family Foundation Report; 1999.
65. Epstein LH, Valoski AM, Kalarchian MA, McCurley J: Do children lose and maintain weight easier than adults: a comparison of child and parent weight changes from six months to ten years. *Obes Res* 1995;3:411-417.
66. Shintani T, Beckham S, Tang J, O'Connor HK, Hughes C: Waianae Diet Program: long-term follow-up. *Hawaii Med J* 1999;58:117-122.
67. Shintani TT, Beckham S, Brown AC, O'Connor HK: The Hawaii Diet: ad libitum high carbohydrate, low fat multi-cultural diet for the reduction of chronic disease risk factors: obesity, hypertension, hypercholesterolemia, and hyperglycemia. *Hawaii Med J* 2001;60:69-73.
68. Shintani T, Beckham S, O'Connor HK, Hughes C, Sato A: The Waianae Diet Program: a culturally sensitive, community-based obesity and clinical intervention program for the Native Hawaiian population. *Hawaii Med J* 1994;53:136-141, 147.
69. Epstein LH, Valoski A, Wing RR, McCurley J: Ten-year follow-up of behavioral, family-based treatment for obese children. *JAMA* 1990;264:2519-2523.
70. Davis SP, Davis M, Northington L, Moll G, Kolar K: Childhood obesity reduction by school based programs. *ABNF J* 2002;13:145-149.
71. Golan M, Weizman A, Apter A, Fainaru M: Parents as the exclusive agents of change in the treatment of childhood obesity. *Am J Clin Nutr* 1998;67:1130-1135.
72. Jelalian E, Saelens BE: Empirically supported treatments in pediatric psychology: pediatric obesity. *J Pediatr Psychol* 1999;24:223-248.
73. Berg F, Buechner J, Parham E: Guidelines for childhood obesity prevention programs: promoting healthy weight in children. *J Nutr Educ Behav* 2003;35:1-4.
74. Krebs NF, Jacobson MS: Prevention of pediatric overweight and obesity. *Pediatrics* 2003;112:424-430.
75. Epstein LH, Valoski AM, Vara LS, et al: Effects of decreasing sedentary behavior and increasing activity on weight change in obese children. *Health Psychol* 1995;14:109-115.
76. Knowler WC, Barrett-Connor E, Fowler SE, et al: Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 2002;346:393-403.
77. Fontaine KR, Redden DT, Wang C, Westfall AO, Allison DB: Years of life lost due to obesity. *JAMA* 2003;289:187-193.
78. Peeters A, Barendregt JJ, Willekens F, Mackenbach JP, Mamun AA, Bonneux L: Obesity in adulthood and its consequences for life expectancy: a life-table analysis. *Ann Intern Med* 2003;138:24-32.
79. Burton BT, Foster WR, Hirsch J, Van Itallie TB: Health implications of obesity: an NIH Consensus Development Conference. *Int J Obes* 1985;9:155-170.
80. Colditz GA: Economic costs of obesity and inactivity. *Med Sci Sports Exer* 1999;31:S663-S667.

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